JAPANESE [JP,2003-022993,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

CLAIMS

[Claim(s)]
[Claim 1] Mix a penetrant remover and a pressurized gas inside a nozzle, and Myst is formed. Using 2 hydraulic nozzles which carry out the regurgitation of said formed Myst from a delivery at the head of a nozzle, are the substrate washing method of performing washing processing of a substrate in which it has a crevice in a processing side, and it sets to said 2 hydraulic nozzles. Myst is formed by supplying a gas to the interior of a nozzle in the range from 50 L/min to 100 L/min. A substrate washing method characterized by breathing out said Myst-ized penetrant remover to a processing side of said substrate after chemical machinery polishing processing in which flattening processing is mechanically performed using a chemical-polishing agent, and performing washing processing to a crevice of a processing side of a substrate.
[Claim 2] A substrate washing method that an amount of a gas which uses said gas in said 2 hydraulic nozzles is characterized by being a range from 60 L/min to 100 L/min in a substrate washing method according to claim 1.
[Claim 3] A substrate washing method that an amount of a liquid which uses said penetrant remover in said 2 hydraulic nozzles is characterized by being a range from 100 mL/min to 150 mL/min in a substrate washing method according to claim 1 or 2.
[Claim 4] In a substrate washing method given in either of claim 1 to claims 3, said penetrant remover is characterized by adding a carbon dioxide (CO_2) at pure water.
[Claim 5] A substrate washing method that said gas is characterized by being inert gas in a substrate washing method given in either of claim 1 to claims 4.
[Claim 6] A substrate washing method that distance from a delivery which carries out the regurgitation of said Myst to either of claim 1 to claims 5 in said 2 hydraulic nozzles in a substrate washing method of a publication to a processing side of said substrate is characterized by being a range from 5mm to 10mm.
[Claim 7] A substrate washing method that drop particle size of said Myst is characterized by being a range from 5 micrometers to 20 micrometers in a substrate washing method given in either of claim 1 to claims 6.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the substrate washing method of supplying a penetrant remover to a semiconductor substrate, the glass substrate of a liquid crystal display, the glass substrate for photo masks, and the substrate for optical disks (a substrate only being called hereafter), and performing washing processing, and relates to the technology which washes the substrate after chemical machinery polishing processing especially.
[0002]
[Description of the Prior Art] There is chemical machinery polishing (CMP [Chemical Mechanical Polishing]) (it is hereafter written as "CMP") accompanying multilayer-structure-izing of the former, for example, a device, etc. which performs flattening processing of a substrate mechanically, using a chemical-polishing agent etc. as one of the technology which carries out flattening of the concavo-convex side of a substrate.
[0003]
[Problem(s) to be Solved by the Invention] However, in the case of the substrate after CMP, there are the following troubles. That is, as shown in drawing 3 , it is the point which the particles Q (particle), such as polishing waste, generate in CMP.
[0004] Above-mentioned particle will remain in the micropores W1, such as an alignment mark which performs mask alignment formed in the processing side of Substrate W, as the residue. When a photolithography process etc. is performed while the above residues had remained in micropore W1 for example, the alignment of a mask will become impossible or it becomes impossible to perform mask alignmen correctly. Or it will become carrying out of the particle to degree process. Although there are chemical cleaning washed with a drug solution etc., physical washing which supplies to a substrate the ultrapure water which a brush is contacted directly, and carries out scrub washing, or gave the ultrasonic wave to the substrate which is carrying out the high-speed revolution, gives supersonic vibration to a substrate, and carries out sonic washing as the washing method of removing such particle, in any, it is not effective.
[0005] Namely, in the case of chemical cleaning, it may be unable to use depending on the class of wiring currently formed in the processing side of Substrate W. In physical washing, by megasonic washing, particle 1 micrometer or less is fully unremovable probably. On the other hand, by scrub washing, a detergency is controlled by a brush contacting Substrate W directly. Therefore, a detergency is not made suitable as it will become the pars basilaris ossis occipitalis of the concave micropore W1, if the detergency by press of a brush is set as the surface location of Substrate W. Therefore, the particle of micropore W1 was fully unremovable.
[0006] This invention is made in view of such a situation, and aims at offering the substrate washing method which washes the substrate after chemical machinery polishing processing.
[0007]
[Means for Solving the Problem] In order to attain such an object, this invention person etc. changed conditions, such as the amount of a washing method, a penetrant remover to be used, or penetrant remover used, respectively, and washed a substrate after CMP, i.e., a substrate after chemical machinery polishing processing.
[0008] In various above-mentioned conditions, particle which remained in micropores, such as for example, an alignment mark, at the time of some conditions was removable. Then, this invention person etc. hit on an idea for the above-mentioned object to be attained based on the condition.
[0009] This invention created based on the above knowledge takes the following configurations. Namely, invention according to claim 1 mixes a penetrant remover and a pressurized gas inside a nozzle, and forms Myst. Using 2 hydraulic nozzles which carry out the regurgitation of said formed Myst from a delivery at the head of a nozzle, are the substrate washing method of performing washing processing of a substrate in which it has a crevice in a processing side, and it sets to said 2 hydraulic nozzles. Myst is formed by supplying a gas to the interior of a nozzle in the range from 50 L/min to 100 L/min. It is characterized by breathing out said Myst-ized penetrant remover to a processing side of said substrate after chemical machinery polishing processing in which flattening processing is mechanically performed using a chemical-polishing agent, and performing washing processing to a crevice of a processing side of a substrate.
[0010] [An operation and effect] According to invention according to claim 1, in various washing conditions By performing washing processing of a substrate after chemical machinery polishing processing using 2 hydraulic nozzles which mix a penetrant remover and a pressurized gas, form Myst, and carry out the regurgitation of formed Myst Particle generated in chemical machinery polishing processing is removable

from a crevice formed in a processing side, especially a processing side of a substrate.
[0011] A penetrant remover is divided by gas which is supplied for explaining in more detail according to the above-mentioned 2 hydraulic nozzles, and a drop is formed. With it, since a gas works also as a carrier in the case of regurgitation of a drop, it functions as a parameter with which the gaseous amount of supply controls a cleaning effect in regurgitation speed of a drop, i.e., a processing side of a substrate. Therefore, washing processing of a better substrate will be performed by controlling the gaseous amount of supply. Moreover, although an activity in a range where a detergency is large is desired in order to remove particle accumulated on a crevice, it is important that width of face of change of a detergency is small on a substrate front face which it is with a pars basilaris ossis occipitalis of a crevice and an upper bed.
[0012] Since a drop of particle size controlled by each which is called Myst is supplied here according to a washing method of this invention, if it is among an example of micropores, such as an alignment mark, a property that a detergency does not change so much will result in acting suitable for clearance of particle.
[0013] In above-mentioned 2 hydraulic nozzles, the amount of a desirable gas and a desirable penetrant remover used is as follows. In the case of a gas, it is a range from 60 L/min to 100 L/min at a range from 50 L/min to 100 L/min, and a pan (invention according to claim 2). Moreover, in the case of a penetrant remover, it is a range from 100 mL/min to 150 mL/min (invention according to claim 3). Particle is suitably removable from a processing side of a substrate under an above-mentioned range.
[0014] Furthermore, that to which a penetrant remover added a carbon dioxide (CO2) to pure water is desirable (invention according to claim 4). Resistivity falls by adding a carbon dioxide, static electricity generated by friction with a processing side of a substrate and a penetrant remover is controlled, and dielectric breakdown of a substrate can be prevented. Furthermore, it is desirable that a gas is inert gas (invention according to claim 5). As inert gas, there are nitrogen (N2), air, an argon (Ar), etc. Since a chemical reaction is not caused to a penetrant remover or a substrate by using inert gas, it does not have an adverse effect on a penetrant remover or a substrate.
[0015] Furthermore, a desirable distance from a delivery which carries out the regurgitation of Myst in 2 hydraulic nozzles to a processing side of a substrate is a range from 5mm to 10mm (invention according to claim 6). Particle can be suitably removed under an above-mentioned range, maintaining a detergency from a processing side and a crevice of a substrate.
[0016] Furthermore, drop particle size of Myst is a range from 5 micrometers to 20 micrometers (invention according to claim 7). Also in a crevice of a processing side of a substrate, particle is suitably removable under an above-mentioned range.
[0017]
[Embodiment of the Invention] Hereafter, one example of this invention is explained with reference to a drawing. Drawing 1 is the block diagram showing the outline configuration of the substrate washing station used for the substrate washing method concerning an example, and drawing 2 is drawing of longitudinal section showing the configuration of the washing nozzle (2 hydraulic nozzles) concerning an example. In addition, by this example, the substrate with which polishing, washing, and desiccation processing were performed within CMP (chemical machinery polishing processing) equipment (graphic display abbreviation) is conveyed to the substrate washing station concerning this example, and the case where 2 hydraulic nozzles are used and washed to a pan is taken and explained to an example.
[0018] As shown in drawing 1 , revolution actuation of the disc-like spin chuck 1 by which six support pin 1a which it comes to form in the shape of a cylinder was set up is carried out through the axis of rotation 3 connected with the base at an electric motor 5. In addition, in drawing 1 , in order to avoid that a drawing becomes complicated, support pin 1a is illustrating only two pieces. By this revolution actuation, the substrate W by which contact support was carried out in the periphery section by support pin 1a rotates in the level surface to the circumference of a center of rotation P. In the perimeter of a spin chuck 1, the scattering prevention cup 9 for preventing that Myst M breathed out from the washing nozzle 7 (it is hereafter written as "2 hydraulic nozzle 7") of 2 fluid types which mix Gas G and the penetrant remover S which were pressurized, and form Myst M disperses is arranged. In case the non-washed substrate W is received from a spin chuck 1, this scattering prevention cup 9 is constituted so that it may go up and down to a spin chuck 1, as the arrow head in drawing shows.
[0019] In addition, in not washing, as mentioned above, the substrate W in this example uses the substrate to which polishing, washing, and desiccation processing were performed with the CMP equipment (graphic display abbreviation) of another object. In addition, the washing processing performed with CMP equipment may be physical washing of chemical cleaning which does not need to use 2 hydraulic nozzles and is washed only by the penetrant remover, scrub washing which a brush is contacted directly and washes it or sonic washing which gives and washes supersonic vibration, etc., etc.
[0020] As shown in drawing 1 , the 2 hydraulic nozzles 7 are supported in the dip direction to which the delivery was vertically turned to the processing side of Substrate W by the support arm 11, and as the arrow head in drawing shows, the rise and fall/splash of them are done the whole support arm 11 by the drive 13. In addition, while constituting the support arm 11 rockabl in parallel to the level surface, the 2 hydraulic nozzle 7 may be constituted so that the processing side of Substrate W may be crossed. In addition, the 2 hydraulic nozzles 7 are arranged so that the delivery of the 2 hydraulic nozzle 7 may come to the location where only distance L was estranged from the processing side of Substrate W at the time of washing. As for this distance L, it is desirable that it is a range from 5mm to 10mm. Particle is suitably removable from the processing side of Substrate W under an above-mentioned range. Incidentally, in less than 5mm, since it is in the condition that Substrate W tends to contact the 2 hydraulic nozzle 7, it is hard to adjust the 2 hydraulic nozzles 7, and there is a possibility of the particle further removed by washing of Substrate W dispersing,

and adhering to the 2 hydraulic nozzles 7. On the contrary, when it exceeds 10mm, there is a possibility that the cleaning effect of Substrate W may become low.
[0021] Supply pipe 15a which supplies a penetrant remover S, and gas installation pipe 15b which introduces the gas G by which application-of-pressure squeezing was carried out are connected with the drum section of the 2 hydraulic nozzles 7. It consists of ultrapure water systems 21 connected to supply pipe 15a by the controller 17 through the control valve 19 by which closing motion control is carried out so that the ultrapure water with which the carbon dioxide (CO2) was added may be supplied as a penetrant remover S. Moreover, it consists of gas feeders 27 connected to gas installation pipe 15b by the controller 17 through the pressure regulator 25 which performs pressure regulation, such as application of pressure of Gas G, and reduced pressure, as well as the control valve 23 by which closing motion control is carried out by the controller 17 so that Gas G may be supplied.
[0022] In addition, although the ultrapure water with which the carbon dioxide was added as a penetrant remover S is used in this example, if it is the penetrant remover used for the usual substrate washing so that it may be illustrated by the ozone water which dissolved an acid, alkali, pure water, and ozone in pure water, it will not be limited especially. Moreover, at this example, by using the ultrapure water with which the carbon dioxide was added as a penetrant remover S, resistivity falls, static electricity generated by the processing side of Substrate W and friction with a penetrant remover S is controlled, and dielectric breakdown of Substrate W can be prevented.
[0023] Moreover, as gas used for Gas G, the nitrogen (N2) which is inert gas is used by this example. There are air, an argon (Ar), etc. as inert gas. In this example, since a chemical reaction is not caused to a penetrant remover S and Substrate W by using inert gas, it does not have an adverse effect on a penetrant remover S and Substrate W.
[0024] In addition, the electric motor 5 mentioned above, a drive 13, control valves 19 and 23, and the ultrapure water feeder 27 are controlled by the controller 17 in generalization.
[0025] Next, the 2 hydraulic nozzle 7 is explained with reference to drawing 2 . The mixed section 29 in the 2 hydraulic nozzles 7 consists of structures, i.e., the structure of a double pipe where the inside of supply pipe 15a is inserted in gas installation pipe 15b, where supply pipe 15a encloses the outside of gas installation pipe 15b, through the supporter 31. Moreover, the point 33 of the 2 hydraulic nozzles 7 connects and consists of an orifice-like pipe and an acceleration tube which is a direct-like cylinder pipe which accelerates Myst M. In this example, the bore phi of the delivery in a point 33 is 3.3mm.
[0026] The 2 hydraulic nozzles 7 may be the structures where gas installation pipe 15b encloses the outside of supply pipe 15a as mentioned above in addition to the structure where supply pipe 15a encloses the outside of gas installation pipe 15b. Moreover, the bore phi of a delivery is not limited to 3.3mm.
[0027] As for the amount of the gas G used in the 2 hydraulic nozzles 7, it is desirable the range from 50 L/min to 100 L/min and that it is a range from 60 L/min to 100 L/min still more preferably. As for the amount of the penetrant remover S used in the 2 hydraulic nozzles 7, it is desirable that it is a range from 100 mL/min to 150 mL/min. Particle is suitably removable from the processing side of Substrate W under an above-mentioned range.
[0028] Next, an operation of the substrate washing station constituted as mentioned above is explained. The distance L from the delivery which carries out the regurgitation of the Myst-ized penetrant remover S as washing conditions to the processing side of Substrate W is 10mm, the amount of the gas G used is 100 L/min, and the amount of the penetrant remover S used is 150 mL/min. And the drop particle size of the Myst-ized penetrant remover S which is formed is controlled by the range from 5 micrometers to 20 micrometers at this time. First, the scattering prevention cup 9 is dropped to a spin chuck 1, and the substrate W after CMP processing is laid in a spin chuck 1. And while raising the scattering prevention cup 9, the 2 hydraulic nozzle 7 is moved to a washing location. Next, carrying out the low-speed revolution of the substrate W with constant speed, Myst M is supplied from the 2 hydraulic nozzle 7 to Substrate W, and Myst M is thrown to Substrate W. After performing fixed time amount and washing processing in the above condition, the regurgitation of Myst M is stopped and the 2 hydraulic nozzles 7 are moved to a position in readiness. The perimeter is made to emit the penetrant remover S which was made to carry out the high-speed revolution of the substrate W simultaneously, and was thrown, Substrate W shakes off, desiccation processing is performed, and a series of washing processings are completed. In addition, the rotational frequency of the substrate W at the time of a low-speed revolution is for example, 500rpm.
[0029] In making the processing side of Substrate W rock the 2 hydraulic nozzles 7, while setting the count which scans Substrate W like the periphery (edge) of Substrate W a center of rotation P - a periphery (edge) as 2 times, the speed which the 2 hydraulic nozzle 7 scans is set as 5 mm/sec.
[0030] The particle generated after CMP by performing washing processing of the substrate W after CMP is removable from the processing side of Substrate W using the above-mentioned 2 hydraulic nozzles 7. For example, though formed in the processing side of Substrate W in the crevice which are micropores, such as an alignment mark, the particle which remained in micropores, such as an alignment mark, is removable. This is considered because it is blown away by diffusion of Gas G while the particle-size drop of a predetermined range collides to the particle accumulated on a crevice. Since the residue as particle does not remain in an alignment mark even if it performs a photolithography process etc. after the result, for example, CMP processing, mask alignment can be performed correctly.
[0031] Furthermore, the distance L from the delivery which carries out the regurgitation of the Myst-ized penetrant remover S as washing conditions to the processing side of Substrate W is 10mm, the amount of the gas G used is 100 L/min, and the amount of the penetrant remover S used is 150 mL/min. Distance L is in within the limits from 5mm to 10mm, the amount of the gas G used is in within the limits from 60 L/min tc

100 L/min preferably within the limits from 50 L/min to 100 L/min, and the amount of the penetrant remover S used is within the limits from 100 mL/min to 150 mL/min. Therefore, since washing conditions are within the limits of these, particle is suitably removable from the processing side of Substrate W.
[0032] That is, if the amount of Gas G or the penetrant remover S used becomes smaller than these ranges, a detergency will become small and particle will not fully be removed. Moreover, when the amount used became larger than these ranges, the drop particle size of a predetermined range was not formed, but it was checked that particle is not fully removed similarly.
[0033] Furthermore, since the ultrapure water with which the carbon dioxide was added as a penetrant remover S is used, dielectric breakdown of Substrate W can be prevented. Moreover, since the nitrogen (N2) which is inert gas as a gas G is used, it does not have an adverse effect on a penetrant remover S and Substrate W.
[0034] This invention is not restricted to the above-mentioned operation gestalt, and deformation implementation can be carried out as follows.
[0035] (1) the substrate washing station applied to this example in this example mentioned above in the substrate W with which polishing, washing, and desiccation processing were performed within CMP equipment (graphic display abbreviation) -- conveying -- further -- although it washed twice as it washed using 2 hydraulic nozzles, you may be only washing by 2 hydraulic nozzles. For example, it may have 2 hydraulic nozzles in CMP equipment, 2 hydraulic nozzles may wash the substrate W after CMP within CMP equipment, and desiccation processing may be performed after that. Thus, if it is washing by 2 hydraulic nozzles even if it is one washing, an effect equivalent to this example can be acquired. Moreover, in having 2 hydraulic nozzles in CMP equipment, it also does so the effect that equipment itself becomes simple.
[0036]
[Effect of the Invention] According to this invention, the particle generated in chemical machinery polishing processing by performing washing processing of the substrate which has a crevice in the processing side after chemical machinery polishing processing using 2 hydraulic nozzles, for example, the particle which remained to micropore, is removable from the processing side of a substrate so that clearly from the above explanation.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the outline configuration of the substrate washing station used for the substrate washing method concerning this example.
[Drawing 2] It is drawing of longitudinal section showing the configuration of 2 hydraulic nozzles concerning this example.
[Drawing 3] It is explanatory drawing showing a substrate with the conventional crevice.
[Description of Notations]
W -- Substrate
S -- Penetrant remover
G -- Gas
M -- Myst
1 -- Spin Chuck
7 -- 2 Hydraulic Nozzles
21 -- Ultrapure Water System
27 -- Gas Feeder

[Translation done.]